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Heat and mass transfer processes caused by natural thermal convection in oil-containing media

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Abstract

Copyright 2017, Society of Petroleum Engineers. This article presents the results of experimental modeling of heat and mass transfer processes in oil-containing media caused by natural thermal convection. In this research we designed the laboratory setup and obtained experimental data for single- and two-component liquids medium with different permeability. It was shown that the dynamic of the media heating and the value of the oil recovery coefficient obtained experimentally and numerically by using the CMG STARS program coincides well. It was found that the processes of heat and mass transfer occur most intensively when the temperature of the medium near the heater reaches the value equals to the boiling point of water. The heating of the zone around the heater occurs faster, if a medium has a lower permeability. The oil recovery coefficient reached 55% with an initial water saturation coefficient of 0.52 and other conditions which corresponded to Ashalchinskoye oil field, Republic of Tatarstan, Russian Federation. This result is in a good agreement with the numerical result calculated by the CMG STARS program.

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